Shortened First Metatarsal Bone and Newly Developed Second Metatarsalgia after Parallel-shaped Modified Scarf Osteotomy for Hallux Valgus Deformity

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Introduction/Purpose: The scarf osteotomy has gained in popularity for the treatment of a symptomatic hallux valgus deformity due to its inherent stability, versatility of correction and early mobilization. We have reported parallel-shaped modified scarf osteotomy (PSMSO) with good functional outcomes and no complication as stress fracture or troughing. However, we encountered second transfer metatarsalgia after the osteotomy. The scarf osteotomy can be shortened, but there was no specific amount of shortening that will produce transfer metatarsalgia in limitation of our literature review. In this study, we measured the shortening of first metatarsal length and investigated the relation of first metatarsal length and second transfer metatarsalgia after PSMSO for hallux valgus deformity.

Methods: We retrospectively reviewed 168 consecutive PSMSOs performed in 124 patients with hallux valgus deformity between March 2009 and August 2015. Concomitant other pathologies of foot or previous second metatarsalgia were excluded. After excluding 45 cases, 123 cases in 88 patients were included. For clinical assessment, VAS, the AOFAS Hallux Metatarsophalangeal-Interphalangeal (AOFAS Hallux MTP-IP) Scale were obtained. The hallux valgus angle (HVA), the intermetatarsal angle (IMA), the distal metatarsal articular angle (DMAA), the first metatarsal length measured by a modified Davies and Saxby’s method and the protrusion of second metatarsal relative to first metatarsal using the Maestro’s method were assessed on standard weight bearing radiographs of the foot. For evaluation of the development of second transfer metatarsalgia, callosity or tenderness beneath the second metatarsal head was investigated. After identifying the lesion, we divided two groups with and without second transfer metatarsalgia and compared the variables after propensity score matching.

Results: Mean follow-up period was 20.6±7.8 (12-66) months. The mean VAS and AOFAS Hallux MTP-IP score improved significantly (p<0.001). Significant corrections in the HVA, IMA and DMAA were obtained and the mean shortening of the first metatarsal length and the mean relative lengthening of second metatarsal protrusion were -3.1±2.5mm and +2.5±2.8mm at last follow-up (p<0.001, p<0.001). Eleven (8.9%, 11/123) cases developed second transfer metatarsalgia after PSMSO. After propensity score matching considered baseline characteristics, 9 cases with second transfer metatarsalgia were compared to 31 cases without it. The group with transfer metatarsalgia showed significant shortening in first metatarsal length and lengthening of second metatarsal protrusion relative to first metatarsal compared to those without the transfer lesion (-4.8±3.8 vs -2.0±2.1, p=0.013, +4.2±1.6 vs +1.9±2.1, p=0.005).

Conclusion: Transfer metatarsalgia is one of numerous possible complications after scarf osteotomy. To avoid complications, we suggest that shortening of first metatarsal bone length should be minimized within -2 mm and second metatarsal protrusion relative to first metatarsal kept within +1.9 mm with considering the metatarsal parabola. If the shortening of first metatarsal was done over -4.8 mm, the additional procedure for second metatarsal may be considered.

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